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ROCKS and MINERALS

Vol. 5. No. 4. DECEMBER, 1930 Whole No. 18

Courtesy of Ramon Conover.

ELLENVILLE LEAD MINE, ELLENVILLE, N. Y.
A Famous Mineral locality of by-gone days.
(Note vein and old shaft in center of photo.)

SPECIAL ARTICLES

HOWE CAVERNS. *By Prof. Harold Orville Whitnall.*

THE COLOR OF AMETHYST. *By George O. Wild.*

A ROCK COLLECTION. *By M. R. Thompson.*

A CHECK LIST OF MINERALS FROM KELLY, N. MEX. *By Herman Wuestner.*

THE MAGAZINE FOR COLLECTORS
2000 Copies Printed This Issue.

THE BULLETIN BOARD

Merry Christmas

ROCKS AND MINERALS wishes to each and all of its readers, subscribers, advertisers, contributors and friends, a very MERRY CHRISTMAS and a HAPPY NEW YEAR.

The editor would like to take each of you by the hand and personally express to you this very real and sincere wish for your success and happiness during the entire 365 days of the new year.

Our announcement in the September issue to disband the Rocks and Minerals Association with this number has brought forth such a storm of protest that we shall withhold our decision to disband or to continue until the March issue.

Although we felt there was a falling off in interest in the Association, our main reason for its disbanding is due to the fact that the work entailed in carrying out the Association's affairs has been tremendous and no relief was in sight. The Association was also a heavy expense and, therefore, a severe drain on our limited resources. With the Association disbanded we could not only give our entire attention to the magazine but the money saved would likewise go to its support and thus ROCKS AND MINERALS would be considerably improved and made more interesting.

DONATIONS TO ROCKS AND MINERALS

Every once in a while some of our good friends make donations to ROCKS AND MINERALS which are gratefully appreciated. Donations are most encouraging also for we feel they are an expression of the donor's keen interest in the magazine and what we are trying to accomplish and their desire to aid us in the work.

Publishing ROCKS AND MINERALS is no simple work—for four years the magazine has been issued at a heavy loss and at times it seemed as if we could continue it no longer. But we have struggled on—encouraged by some cheerful letter or an interesting article which had been contributed. A donation, therefore, financially or otherwise, acts as a stimulant to prepare future issues of the magazine with more care and pleasure than in the past.

In this issue we wish to acknowledge our thanks and appreciation to Messrs. Ramon Conover of Kyserike, N. Y., and Fred W. Schmeltz, of New York City—two of our warm friends and admirers. Both of these members and subscribers, who are personal friends, have donated a large series of interesting photos of mines, mineral localities and rock formations which we shall take great pleasure in reproducing in ROCKS AND MINERALS (one of which appears on the front cover of this issue). A number of interesting specimens have also been donated us from some of the localities visited by these friends of ROCKS AND MINERALS.

For what we especially wish to thank these friends are the number of trips we were able to take to mineral localities for Mr. Conover came down in his car no less than five times to take us out; Mr. Schmeltz coming up from the city on his motorcycle to join us in Peekskill. Among the localities visited and at which many interesting minerals were collected are: the emery mines near Peekskill; the Anthony's Nose pyrrhotite mine; Todd, Croft, Canopus and Tilly Foster iron mines; and the quarries at Bedford, N. Y. (3 trips) and Branchville, Conn.

That these trips were keenly enjoyed and much appreciated may be realized when the fact is brought to light that we have had no vacation in over ten years, so that a little trip of only a few hours duration is a vacation indeed.

There is nothing like a complete relaxation from one's work and to a mineral enthusiast a trip to a locality where interesting specimens may be had is an ideal rest.

WANTED: Correspondents in all parts of the world who will be kind enough to send us notes and news items on minerals, etc., that they think may be interesting to the subscribers of ROCKS and MINERALS. Such as are available we shall be very glad to print in the magazine.

ROCKS AND MINERALS

The Magazine for Collectors

Published Quarterly

Peter Zodac
Editor and Publisher

The Official Journal of The Rocks and Minerals Association

Vol. 5, No. 4 DECEMBER, 1930 Whole No. 18

CONTENTS

Howe Caverns *By Harold Orville Whitnall, Prof. of Geology, Colgate U.* 109
The Color of Amethyst. *By George O. Wild* 116
Illinois Asserts Herself. *By M. M. Leighton, Chief, Ill. State Geol. Survey* 119
A Rock Collection. *By M. R. Thompson* 120
Mineral Localities Information Department 122
Little Journeys. *By Albert C. Bates* 123
Field Museum Notes and News Items 124
A Check List of Minerals from Kelly, New Mexico. *By Herman Wuestner* 127
Gem Mines of South America—Amethyst Mines 131
Museums of the World—Houston Museum of Natural History 132
The Gem Department—Tourmaline. *By Gilbert Hart* 136
Jade. *By Eugene W. Blank* 138
Gems of the Southwest—Chrysoprase. *By Nell Lounsberry* 139
A Compilation of Gem Names. *By Gilbert Hart* 140
Some Notes on the Ruby. *By George O. Wild* 142
Mineralogical Notes. *By Albert C. Bates* 143
A Trip to the Illinois Geode Field. *By T. P. Pettigrew* 144
Bibliographical Notes 145
The Sluice Box. *By A. Riffle* 145
The Rocks and Minerals Association 146
Membership Department 147

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BOOK DEPARTMENT

Rocks and Minerals **Peekskill, N. Y.**

Howe Caverns

— *By* —

HAROLD ORVILLE WHITNALL
Professor of Geology, Colgate University, Hamilton, N. Y.

In a region of rugged hills and fertile valleys, abounding in Indian lore and hallowed as a stronghold of American patriots, there lies, in eastern New York, a ridge of limestone, its lower inclines mantled with rich fields and its upper reaches studded with scattered woodlands. Flecked by sunshine and cloud, its grassy meadows rippled into shiny waves by the winds of summer and covered by a sheet of dazzling whiteness in winter, this strong but gentle slope is a thing of beauty.

Gazing upon this quiet pastoral scene, one would not dream that far beneath the forest crested hill and open meadow land lies a subterranean palace with spacious courts, not unlike the one built by Pluto, the god of the underworld, for his bride Persephone.

This underground wonderland is located in Schoharie County, New York, a few miles from the charming village of Cobleskill. Although known to the Indians as *Otsgaragee*, "the cave of the great halls", it was not entered by a white man until 1842 when Lester Howe explored a portion of it. Through priority of discovery, his name was given to these caverns and for nearly a century they have been known as Howe Caverns.

Thirty years ago the writer visited these caves, exploring them by the dim wavering flame of a smoky torch. It was precarious footing and the natural beauty of the cave suffered through insufficient lighting. But now gravel paths of gentle gradient wind through the galleries and a thousand clear and steady lights illuminate the splendid spectacle, bringing out the glorious colors of stalactite, stalagmite, and flow-stone and sending their rays into stony nooks and corners.

To the casual sight-seer, the first glimpse of the caverns is awesome. For unless one is accustomed to caves or mines, one is apt to experience a momentary tremor at the realization that the sunlit earth is far above him. But this quiver becomes a thrill as the beauty of the cave breaks upon his view.

For nearly two and one-half miles the visitor is conducted through strange and enchanting realms. On all sides and above are bizarre forms sculptured in stone and tinted by the magic pigments of mineral colors. He is astounded by the huge stalagmites whose growth began eons before man walked the earth; he is amazed at the work of underground waters; amused by the imitative forms that stalactite, stalagmite, and flow-stone have assumed, and the depth of his spirit is stirred when the realization breaks upon him that all this gorgeous splendor was accomplished by water and time working together in the Stygian darkness of the earth.

To the geologist and student of earth science, Howe Caverns present a splendid laboratory where the work of underground water may be studied at leisure in well lighted quarters. Although having many things in common with other limestone caves, Howe Caverns have many features that are of peculiar interest to even the most jaded students of subterranean passages.

One outstanding feature is that they have been formed in very ancient limestones. A large number of noted caverns in the United States are found in the rocks of the Carboniferous period while these represent the solution channels in the much older Silurian and Devonian limestones. Indeed, there is a very interesting section exposed along the cavern walls showing the contact of these two great periods of Paleozoic time.

The influence of joint-planes in determining the course of the underground stream is clearly manifested in the Winding Way. (Plate I). The stream that excavated this tortuous channel was evidently a weak one, as it was never able to break away from the control of these lines of vertical weakness. The result is that it swung from side to side seeking the lines of least resistance. On the other hand the master stream of the cavern was, because of its greater power, able to gnaw a straighter pathway. (Plate II).

A singular feature of the caverns is the predominence of immense stalagmites

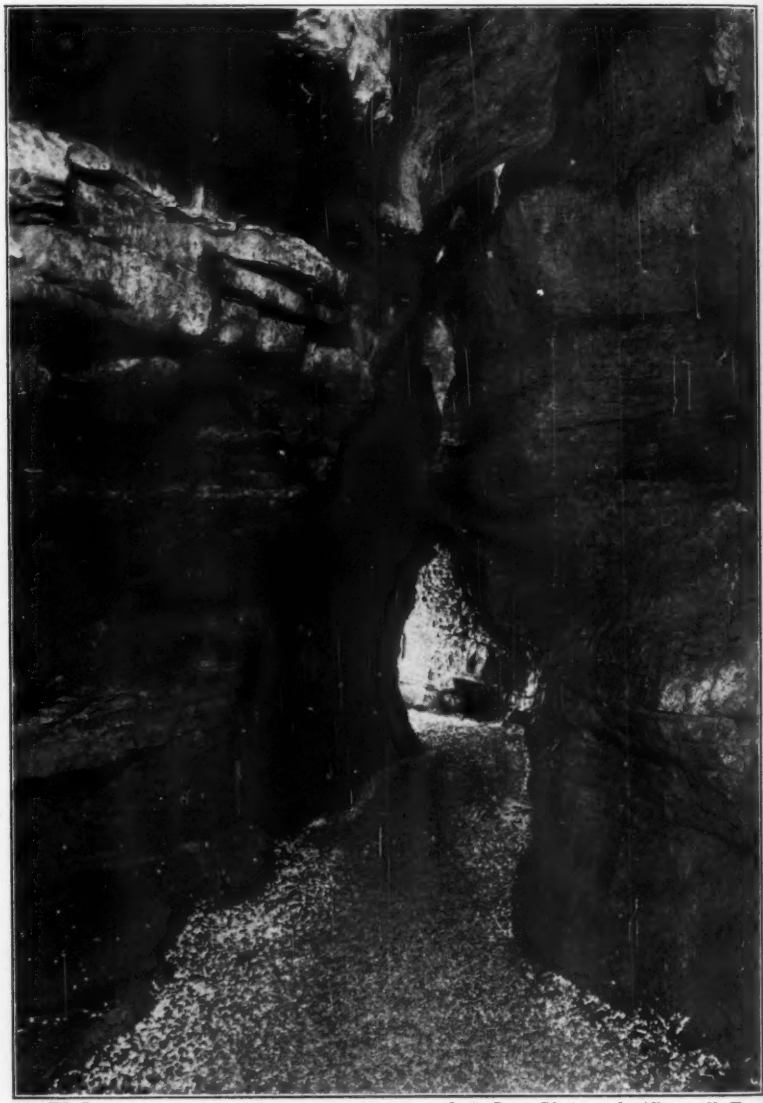

PLATE I *J. A. Lenn Photograph, Albany, N. Y.*

A Bit of Winding Way, Howe Caverns, N. Y.

PLATE II *J. A. Lenn Photograph, Albany, N. Y.*

THE LAGOON OF VENUS, HOWE CAVERNS, N. Y.

PLATE III *J. A. Lenn Photograph, Albany, N. Y.*

THE GREAT BEEHIVE, HOWE CAVERNS, N. Y.

PLATE IV *J. A. Lenn Photograph, Albany, N. Y.*

THE BISHOP'S PULPIT, HOWE CAVERNS, N. Y.

PLATE V *J. A. Lenn Photograph, Albany, N. Y.*

THE LEANING TOWER OF PISA, HOWE CAVERNS, N. Y.

over large stalactites. Usually there are three reasons for such remarkable discrepencies, chief among them being the character of the roof. A limestone that permits rapid seepage allows the water to drip rapidly, thus preventing the deposition of lime as stalactites. This water falling on the floor contains all the material originally held in solution. Hence the stalagmites receive the entire dissolved mineral matter, a part of which, under ordinary conditions, would have been left behind in a stalactite.

Again stalactites may have been formed, but after attaining sufficient size and consequent weight may have fallen and become embedded in the stalagmitic material already accumulated, thus rapidly building up the stalagmite. A fall of the roof may also have occurred. If this had been the case the stalactites which had been formed would have been buried under the blocks when they crashed to the cavern floor. Hence a new assemblage of younger and therefore smaller stalactites would appear.

The writer is inclined to the opinion that this latter theory accounts for the presence of so many baby stalactites as compared with gigantic stalagmites, as the Great Beehive (Plate III). This theory has support from the fact that large stalagmites occur under the edges of the roof. Their presence would indicate that the texture of the roof rock permitted the formation of stalactites and therefore was once entirely studded with large pendant forms, but that falls from the central portion of the ceiling destroyed them. In fact the accumulation of rock debris, called the "Rocky Mountains", testifies to one tremendous fall.

There are especially two stalagmites which have unusual interest for the student. They are called the Bishop's Pulpit (Plate IV) and the Leaning Tower of Pisa. Both of these are fluted with vertical grooves which, although part of the stalagmite, are really secondary stalactites formed by the drippings from the dome of the stalagmite. Their interior structure shows the same radiating crystal structure as found in true stalactites. In this connection these secondary stalactites frequently merge at their tips into secondary stalagmites. The Leaning Tower of Pisa (Plate V) illustrates a series of alternating stalactites and stalagmites of a secondary origin.

The magnificently lighted galleries of Howe Caverns open up vistas of turreted stalagmites, standing at a distance like eerie phantoms. Pendant stalactites, pale yet glittering, as if frosted by moonlight, hang from the vaulted ceilings. Flowstones, gleaming green white like frozen cascades of a mountain stream, flank the walls. Stone draperies hung and looped back by the stage-hand gnomes of the underworld frame the scenes wherein are set the tableaux of this Pageant of Time.

Sermons in Stones

"There are no natural objects out of which more can be learned," writes Ruskin, "than out of stones. They seem to have been created especially to reward a patient observer. Nearly all other objects in nature can be seen to some extent without patience, and are pleasant even in being half seen. Trees, clouds, and rivers are enjoyable even by the most careless; but the stone under his foot has, for carelessness, nothing in it but stumbling; no pleasure is languidly to be had out of it, nor food, nor good of any kind; nothing but symbolism of the hard heart, and the unfatherly gift. And yet, do but give it some reverence and watchfulness, and there is bread of thought in it, more than in any other lowly feature of all the landscape. For a stone, when it is examined, will be found a mountain in miniature. The fineness of Nature's work is so great, that into a single block a foot or two in diameter, she can compass as many changes of form and structure, on a small scale, as she needs for her mountains on a large one; and taking moss for forests, and grains of crystal for crags, the surface of a stone in by far the plurality of instances is more interesting than the surface of an ordinary hill; more fantastic in form, and incomparably richer in color."

—The Christian Science Monitor.

The Color of Amethyst

—— *By* ——

GEORGE O. WILD

Inst. f. Edelstein-forschung, Idar, Germany*

While considerable progress has been made towards the solution of the problems underlying the pigmentation of precious stones through the employ of the spectrographic method, firstly introduced by the writer into this field of research, some stones resist completely however all attacks of modern science. Up to about ten years ago the color problem was entirely unsolved and investigations seemed to have come to a standstill; there was no method known by which to proceed further into the matter. Chemical analysis was unable to detect any traces of metals on which the blame for the colors could be pinned. It was concluded that the coloring matter was present in such minute quantities as to evade detection by the ordinary methods. New ways of investigation had to be found. The spectroscope revealed several metals present in quantities of one-thousandth of one per cent and less and today it can be said that some of these metals doubtlessly are responsible for the various colors as chromium in precious topaz, chromium and vanadium in emeralds, caesium in morganites, etc. With kunzites the minute ingrediencies can be readily traced and tabulated but there remains some doubt as to which metallic element the color is due. How the colors come about in the stones, even with the metals known, is still on unsolved problem. It can be hoped that speculation will point out ways for further experimentation. The matter looks very simple to the layman, especially as a large variety of colors can be produced at will in synthetic stones, but every step into the jungle of possibilities needs a clearing of way by countless experiments. A new spectrographic method is now being evolved and will doubtlessly yield decisive results in some cases and clear pending questions.

The method of spectroscopic investigation and analysis can be briefly described as follows: the body to be analyzed is brought into the carbon arc and therein evaporated. The glowing vapors emit certain light waves and the wave lengths of which are fixed on a photographic plate and measured thereon. Certain elements have specific wavelengths and can thus be readily found.

When this method was used on the quartzes (rock crystal, amethyst, burnt quartz topaz, citrine and smoky topaz) it was found that they contained no elements which could be held responsible for the colors. Traces of sodium and lithium were found to be present in all quartzes and no connection could be established between the color and these metallic additions. It was formerly thought that manganese caused the violet tint but it could be demonstrated without any doubt that this metal is entirely absent in amethysts and also in the other varieties above listed. Manganese however appears sometimes in certain varieties of amethysts, especially in those from Uruguay and Madagascar; it is a part of the mineral called goethite which forms sphaerolitic or dendritic inclusions within amethyst crystals, but the addition is purely mechanical and has nothing to do with the color directly. It was also thought by various investigators that iron in some form causes the color and this is today the theory of Holden, who has done very extensive work in this field. His article, published in "The American Mineralogist" several years ago, covers the entire field of research in this line and older theories can be read up there. It contains Holden's own theories and assumptions and while it cannot be definitely said that iron is absent in amethysts, the extremely sensitive spectrographic method has revealed no traces of it. The writer has no reason to believe that iron causes the color otherwise the wave-length lines of iron should have been enhanced in intensity or number on the spectrographic photos taken by him in large numbers on amethysts of various provenience. A refined spectroscopic analysis, as is expected to be prac-

*Institute for Precious Stone Research.

tically realized very soon, will clear these matters easily and until then no decision can be reached.

Recent investigations into the cause of color of blue rock salt have revealed some startling facts which have a bearing on the color problem of amethyst in many ways and which can be summed up as follows: rock salt, if heated for some time in vapors of metallic sodium, takes on a blue tint due to a deposition of sodium particles of extreme fineness between the layers of the salt molecules which build up the crystal of ordinary rock salt. This blue color can also be produced in other ways, for instance, by putting the salt under the influence of radiation emitted by radium and Roentgen Ray tubes (X-Rays). In the following we will call this simply "radiation". It is believed that naturally blue rock salt has been given its color by radiations from the surrounding rocks which contain radioactive elements. Rock salt is a chloride of sodium and it is the theory that through a process which is known as "ionization" metallic sodium is split off the molecule. These particles which carry an electric charge absorb certain light waves and hence color. This theory of ionization is well founded but it has also some opponents. New experiments have been carried on in the Institute of Radium Research of Vienna and have revealed that the blue tint can also be produced by subjecting rock salt to high pressure and to heat thereafter. It has been concluded that the splitting off of the sodium particles or sodium ions is eased by the deformation caused by the pressure. The color appears in regions of greatest stress and deformation as well as along lines of fracture.

Just as the molecule of salt is composed of a gas "chlorine" and of a metal "sodium", so is the quartz molecule composed of a gas "oxygen" and a metalloid "silicon". It has been known for some time that white quartzes, such as rock crystal, become brownish when subjected to radiation and the quartz thus obtained acts in all ways like the smoky quartz of nature. It has been shown that the latter is present within rocks containing high percentages of radioactive minerals. After the negative spectroscopic finds, the writer concluded, together with R. Klemm, that the brownish color was due to a splitting of the silica molecules. Holden came to the same conclusion. The theory needs substantiation by a decisive experiment. One would need to radiate quartz in a high vacuum and heat it after the brownish color has appeared; if it is really due to the splitting of the molecule some free oxygen gas must be liberated and emanated from the crystal though the possibility exists that it would recombine with the silicon through the effect of the heat. Very small amounts of the oxygen gas could be traced by the spectroscopic examination of the electric discharge through the vacuum tube wherein the quartz was heated.

What, now, is the cause of the violet color of amethysts? It has been held by many early investigators and also by Dr. Holden that an iron compound produced the tint. This belief is substantiated by the fact that the amethystine color turns yellow when the crystal is heated and also by calorimetric investigations of Dr. Holden who found increasing amounts of iron with increasing intensity of color. Contrary to this, the writer's spectroscopic examinations showed no iron contents, at any rate, the same of iron, if there was any, was found to be present in colorless rock crystal. (The iron traces might provene from the carbons used in the experiments.)

There are now several possibilities; the color is either due to a ferric compound or to a splitting of either the mineral's own molecule or that of the sodium or lithium compounds which all quartzes carry as parasites within their structure in submicroscopical cavities parallel to their optical axis.

The first possibility is severely shaken by the following observation firstly made in the writer's laboratory. When colorless quartzes are radiated a smoky color appears as has been said before. White rock crystal from every possible provenience has been radiated but never a trace of bluish color appeared. When natural amethysts, however, are decolorized by heating to a temperature of 575 degrees Centigrade and thereafter subjected to radiation the original amethystine color reappears with the smoky color superimposed. This "smoke" can be driven off by heating and the original color can be restored. (The article of Holden's states that pale amethysts can be darkened by radiating and in some of the literature it is being stated that recoloring by radiating evolves a deeper colored amethyst; this is not a fact; both statements have been copied from older literature without control by experiments. The deepening of

the color is an optical delusion inasmuch as the superimposed "smoke" darkens the stones to a certain extent but the violet color is not enhanced at all. The darker stone would be of no value at all to jewelers; to the contrary they appear dull and lifeless).

The effect of radiation is, however, entirely different on colorless quartzes which were fused before treated. Fusing of rock crystal at very high temperatures produces a glass wholly composed of silica having properties entirely different from those of the original substance. The glass is dull and softer than rock crystal but it has gained a new property of high technical value; it can be heated up to extremely high temperatures (white heat) and dropped into ice water or even liquid air without cracking. The internal structure of the rock crystal has been destroyed and the resulting glass is no longer a solid body in the scientific sense of the word but a highly viscious liquid as is every other glass. When this fused quartz glass is radiated it gains an amethystine color mixed with smoky hues just like recolored natural amethysts. The violet tint is stable in sunlight and withstands the same temperatures as the color of natural amethyst. Here is a clue for further investigations! Why does the crystallized material become only smoky while the same substance when void of its internal crystalline structure becomes violet?

Amethysts are the same as rock crystal as far as chemical composition is concerned; both are SiO_2. There exists two kinds of quartzes, those that rotate the plane of light to the right and those that rotate it to the left; they are called right and left handed crystals. All textbooks of mineralogy will describe this fully enough so that the matter can be just stated here without further comment. Rock Crystal is generally either right handed or left handed or both kinds of structure are mixed with the same crystal, but so that larger patches of the piece are only "right" and others only "left." With amethyst the case is however entirely different. They consist of alternating left and right turning lamellae which are mostly only fractions of one millimeter in thickness. The color of the amethyst appears within the contact zones of these lamellae; the material between remains pure white quartz. The striations of amethyst can be observed on almost every piece when viewed in the right light and angle. These zones of contact between two structurally different kinds of quartz can be regarded as lines of disturbed molecular structure besides the possibility exists that here foreign matter might be deposited as these zones can also be considered to be boundaries of varying growth of the crystal.

When examining artificially colored quartz glass it appears that the violet color is not distributed homogenously through the mass but also appears in distorted striae, as if the blue patches had flowed within the molten mass. Quartz glass is optically inhomogenous and cannot be used for fine optical work. It seems that the entire mass has not fused entirely but that the separate pieces have just become plastic enough to fuse into each other. Some differentiation remains and along these boundaries the color shows up when radiated. All this points to ionization and the phenomenon appears closely connected with those observed with rock salt.

It requires a lot of further experimentation before the problem of the color can be solved. The conditions here are very complicated and the matter cannot be easily disposed of as has been done heretofore. A seeming coincidence between the color and some isolated chemical find is not enough to explain matters and allow conclusive statements.

As to the new ways of investigation it may be pointed out that the modern infra red spectroscopy will allow science to proceed further into this problem. It has been shown that quartzes have an absorption band in the infra red spectral zone located at about 3 microns (wavelength). Smoky quartz absorbs like rock crystal but the amethyst absorbs much stronger than any other kind of quartz. If it could be shown that the absorption varies with the color and if the same could be proven for violet quartz glass a number of conclusions could be drawn. Unfortunately the necessary apparatus is not at the disposal of the writer who could however furnish the cut sections of amethysts without any cost for a possible future investigator. The ultra miscroscope is also destined to help in this field of research and it can be hoped that within a few years new facts will be discovered and new lanes of investigation will be opened so that not alone the problem of the color of amethysts but that of all other precious stones, minerals and glasses will be solved.

Illinois Asserts Herself

—By—

M. M. LEIGHTON
Chief, Illinois State Geological Survey, Urbana, Illinois

Very few people, even in this State, realize that in the value of her rock and mineral products, Illinois outranks at least 41 other states each year. The production list includes: coal, coke, petroleum, natural gas, limestone, lime, marl, sandstone, sand and gravel, silica sand, steel molding sand, common molding sand, clay and clay products, fluorspar, fuller's earth, tripoli, ochre, galena, sphalerite, etc. Besides those which have commercial value, there are to be found in Illinois hundreds of varieties of rocks, minerals and fossils which are of interest to collectors.

The Illinois State Geological Survey has been conducting geological investigations for the past 25 years and has, of course, published the results in the form of technical or semi-technical bulletins. It was to make this accumulated information available to the science teachers of the State in non-technical form that a new program of educational extension was conceived.

One of the most important phases of the extension program consists of the preparation and distribution of sets of the common rocks, minerals and fossils of Illinois. These collections, with printed labels, are to be made available for use in the high schools, and are to be supplemented by study manuals which will describe, locate, illustrate and discuss all the mineral resources of this State.

Two sets will be sent to each school from which an application is received. One set, of choice specimens, labeled and mounted for framing or placing in a cabinet, will be intended for exhibition only. The other set, of loose specimens, is intended for actual class use. One hundred applications will be honored in the first distribution. More sets will be assembled later, according to the demand for them.

It is expected that the release of such materials and literature will result in an increased interest in, and a greater appreciation of, the natural history and mineral wealth of Illinois.

In addition to the distribution of the rock, mineral, and fossil collections, the extension program provides for the publication of a series of educational bulletins on the geology, geologic history, and mineral resources of specific local areas in all parts of the State. Also, a successful effort is being made to organize groups of science teachers in various parts of the State, to function permanently as "earth history field study clubs." The Survey will conduct these groups on field trips to points within the State's area which best exhibit geological conditions and which promise to be of interest from the standpoint of mineral resources. Six of these field trips were held during 1930, and there is every indication that the project will become a firmly established institution by next year.

Miss Betty Youngman, of 2100 Eagle Ave., Alameda, Calif., is a young lady of 14 who is keenly interested in the fascinating study of minerals and has been collecting them since she was 9. Her interest in minerals began really while she was in the third grade in school. When going to and from school she used to pick up little specimens of bright colored quartz and jasper and display them in her yard, of course at that time she knew nothing about minerals. A little later she became acquainted with a teacher who taught earth science in Berkeley, Calif., and this teacher for two years taught Miss Betty mineralogy after school hours. Miss Betty's collection embraces about 200 specimens and as many of them are small and of poor grade, we are very sure she would be delighted to receive, as gifts, any minerals that some of our readers may care to send her.

Of course Miss Betty is a subscriber to ROCKS AND MINERALS and a member of the Rocks and Minerals Association and she is keenly interested in our magazine and its success.

A Rock Collection

—— *By* ——

M. R. THOMPSON

20 *Williams Lane, Chevy Chase, Maryland*

Many collectors probably regard rocks as less interesting or important than minerals. This attitude may arise from the heterogeneous composition of many rock species and the consequent difficulty of identification by simple methods, the usual lack of striking color and crystallization, and the fact that rocks are commonplace and of slight intrinsic value.

As far as it exists, this situation is unfortunate. From the collection standpoint, rocks are always easier and cheaper to obtain than good minerals. Any collector's immediate vicinity will usually yield at least one and frequently a large number of rock specimens without much effort. On the other hand, few persons are fortunate enough to live near a mineral deposit. Even so, the supply of mineral specimens is likely to be uncertain and their collection may involve the expenditure of time, labor and money to a far greater extent than with rocks.

Besides availability, rocks merit the attention of the mineral collector for a more important reason. They are the containers or storehouses and, in a sense, the producers of the mineral deposits, from which we obtain the rarer and more prized specimens. For intelligent and efficient mineral collecting, a knowledge of rocks is most helpful, while for prospecting and mining for economic minerals it becomes almost indispensable. Prospectors would collect fewer barren rock samples and find valuable minerals with greater ease, if they knew rocks as well as they did minerals. This point may be illustrated by recalling a few of the well-established associations. For example, chromite, magnesite and asbestos with serpentine rocks; gems, lithium and radio-active minerals with pegmatite granite rocks; copper and gold with conglomerate rocks, etc.

Rocks are also more familiar in a general way to the average person, and of greater utility in the natural state, than are minerals, even though accurate knowledge of composition and properties of rocks may be lacking. This is due to the extensive use of rocks for building and decorative stone, road metal, concrete, walls, walks, monuments, rock gardens, etc. It hardly needs mentioning, that rocks, as an essential part of the earth's surface, present themselves to view almost everywhere. We see them as mountains, hills and cliffs, in stream beds and on beaches. For these reasons, rocks really furnish an easier and more natural introduction to the collector's art than do minerals.

As a rule, the labeling of a study collection of rocks should be done on the basis of a petrographic identification. Chemical analysis may also be necessary. Specimens thus accurately identified are obtainable from dealers at a nominal price. With these as a reference guide, specimens picked up on field trips can be named reasonably well by using simple methods and a hand lens. A rock collection should usually supplement the mineral collection proper. Many hundreds of species are offered and what to select is certainly more difficult of decision than with minerals. Either the dealer can be relied upon to furnish a representative assortment, or else the buyer can himself list those species most prominently described in works on petrology, prospecting and mineral deposits. In the latter case, it will be interesting to add a few specimens of rare, unique or beautiful rocks in order to furnish variety and relief to what might otherwise seem merely conventional and professional. Polished rock specimens are rather expensive and usually furnished in large sizes only. They are, therefore, chiefly of interest to specialists, schools and museums.

An elementary collection of minimum size should include about 25 or 30 specimens as follows: Igneous rocks, including biotite granite, hornblende granite, pegmatite or graphic granite, porphyritic granite, rhyolite, syenite, diorite, diabase or dolerite, gabbro, basalt, peridotite, felsite and obsidian; Sedimentary rocks, including travertine, chert, conglomerate, conglomerate breccia, sandstone and shale; Metamorphic rocks, in-

cluding biotite gneiss, mica schist, quartzite, slate, soapstone, marble, serpentine and an iron oxide rock such as jaspilite. No rare rocks need be included in such a collection. As regards texture, color and locality, these specimens should be as representative of common types as is possible. A western prospector's collection should be much larger, including at least 80 to 100 specimens, on account of the large number of porphyritic and glassy igneous rocks found in the Rocky Mountain region, also to better illustrate the sedimentary and metamorphic rocks of more complex or less common type.

The collection to be described here is yet larger and more representative. There are at present about 120 specimens, which are kept in 1½x2 inch pasteboard trays. The specimen size is that rated "1x2 inches" by the dealer. As this varies a good deal, considerable trimming has been required. It must be admitted that this size is rather small to well display the porphyritic texture of igneous rocks containing large phenocrysts, as well as gneissic and coarse conglomeritic structures, but on the whole it does quite well. The result is that the entire collection, with trays, weighs only 12 lbs. and is stored in a 17x25 inch centre desk drawer, conveniently at hand for reference. It has been a source of pride and satisfaction. When some thrilling article on economic geology, or mineral deposits, is being read, and the learned author expatiates on "quartz monzonite porphyries," "hypersthene diabases," or "lit-par-lit gneisses", well, there they all are close at hand. The article seems more "concrete," if not actually "rocky", when one can see and feel a specimen of similar type to that being described in place at some distant mine or mountain range.

It should be said that, up to the present, the *rock-forming mineral* specimens have been kept in the mineral collection proper, which is much more extensive and has pieces of average size twice that of the rocks. In general, it would probably be better to include the special rock minerals with the rocks, but in this case, the rock collection was arranged last and a readjustment has not yet seemed necessary.

The collection mentioned was based on the self-selection plan. Some specimens of good type, 13 per cent of the total, have been collected in the field or obtained through friends, but most of the collection had to be purchased. It may be of interest to note the relative importance of the three great rock groups as judged by their representation:

Igneous rocks include	66%
Metamorphic rocks include	21%
Sedimentary rocks include	13%
Total	100%

The preponderating diversity and interest of the igneous rocks is quite apparent. If this collection had been arranged by a stratigrapher, the story would be quite different. The above percentages do not, of course, in any way represent the actual distribution of rocks in the earth's crust.

Regarding localities, other interesting deductions can be made. Rocks are present from 25 states and the District of Columbia. Of the total, Colorado has supplied 21 per cent, Massachusetts 17 per cent and New York 9 per cent of the specimens. Those from Colorado are practically all igneous and come chiefly from Boulder, Chaffee and Teller (Cripple Creek) Counties. The situation as regards this State is presumably due to two reasons. The first is that Colorado must be especially rich in igneous rocks, attractive to petrographers. The second is that the dealer must have succeeded in making good collecting contacts there. These two reasons are obviously related. Massachusetts is very rich in rocks of all classes, which have been extensively studied. Being the writer's native state, more collecting has also been done there.

Few foreign localities are represented. Only England, Canada, Western Australia, Tasmania, South Africa, Italy and Chile are now included. Dealers tend to offer native rocks in preference to foreign, as freight charges are heavy and prices must be kept low. Purchasers are also inclined to select native rocks, because of the greater chance of encountering them in place sometime.

This account will be closed by a description of a few selected rock specimens of special interest or charm.

(A) Attractive rocks. (1) Italian marble (metamorphic) from Siena, yellow, much used as a fine building stone. (2) Conglomerate breccia (sedimentary) of red jasper and brown limonite, from South Dakota. This is very striking and is used to some extent for building purposes. (3) Black obsidian (igneous) with gray feldspar spherulites, Utah.

(B) Unique rocks. (1) Oolitic quartzite (metamorphic), like fish roe, gray, with black spots, Pennsylvania. The books mention only one other locality, Sumatra. (2) Leopardite (igneous), white quartz porphyry spotted with black oxides of iron and manganese, North Carolina. (3) Cumberlandite (igneous), a titaniferous peridotite from Rhode Island, having the texture of an iron-olivine meteorite and possibly passing into terrestrial native iron at depth. (4) "Zebra Rock", a new rock from Western Australia, striped, not yet classified.

(C) Historic, economic rocks (as gangue). These are famous for valuable mineral more or less distributed throughout the rock formation. (1) Kimberlite(igneous), a diamondiferous peridotite from South Africa. (2) Auriferous conglomerate (sedimentary), "banket" from the Rand, South Africa. (3) Cupriferous conglomerate (sedimentary), Michigan.

(D) Missing rocks. These do not seem to be available at present and are only ghost members of the collection. They will be added whenever located. (1) Greenalite (sedimentary), an iron silicate rock, which may have produced the Lake Superior hematite iron ores. (2) Graywacke (sedimentary), an impure sandstone. This term seems to be used rather loosely and although the species is said to be common in certain localities, it may be difficult to get typical material.

References:

Rocks and Rock Minerals. By L. V. Pirsson and A. Knopf.

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Geology Applied to Mining. By J. E. Spurr.

Handbook for Prospectors. By M. W. von Bernewitz.

Granites of the Southeastern Atlantic States. By T. L. Watson, U. S. Geological Survey Bulletin 426. Leopardite (page 135.)

Geology of Massachusetts and Rhode Island. By B. K. Emerson, U. S. Geological Survey Bulletin 587. Cumberlandite (page 184)

A Text-Book of Geology, Part I, Physical Geology. By L. V. Pirsson.

MINERAL LOCALITIES INFORMATION DEPARTMENT

Members desiring information regarding minerals or mineral localities in the following states may obtain it by writing to the Collectors listed and enclosing a self-addressed stamped envelope.

THE NORTHWEST—Washington, Idaho, Montana, Oregon and parts of British Columbia	Charles O. Fernquist, Curator of Mineralogy, Public Museum, 2316 First Avenue, Spokane, Wash.
Oregon, Southern Idaho, Northern Nevada	Dr. Henry C. Dake, 793½ Thurman Street, Portland, Ore.
The Oregon Coast, South and Western Oregon, Northern California, Southern Washington	John M. Tracy, 601 Orange Street, Portland, Ore.
Petrological Information in Central Eastern Iowa	Prof. Wm. J. H. Knappe, Curator, Wartburg College Museum, Clinton, Iowa.

Little Journeys

— *By* —

ALBERT C. BATES
Newark, N. J.

This is the continuation of an interesting series of articles on dealers and collectors that flourished forty years ago.—The Editor.

In retrospect. I am writing this on a beautifully serene June day, part of which was spent in looking at some as lovely crystals as one could wish to see, some of them being in my possession for forty years or more; recalling how I came by them, and then into a general retrospect.

All of which was very pleasurable to me, and perhaps I can pass a measure of it on to you. If one reads carefully what this magazine is trying to accomplish, one may see that the collecting of rocks and minerals is advancing apace. It may be a renascence of the fad that lagged about 1910. Let us hope so.

I should very much like to see another such week in the local mineral world as I took part in when the members of the New York and Brooklyn Mineralogical Clubs gave an exhibition of their choice specimens in a great hall on Montague street, Brooklyn, in 1894, under the auspices of the Brooklyn Institute of Arts and Sciences, and invited the public to attend. As an exhibition it was a success in every way.

A large glass covered case was assigned to each member wishing to exhibit. The dealers were invited to show their wares with the privilege of making sales, deliveries to be made at closing time, and many sales were made. Mr. Pennypacker came up from West Chester, Penn., with more minerals from Laurium, Greece, than he could show at one time. He knew his wares and how to dispose of them. He was a lawyer by profession, a good story teller; in size a very big man, and "because he found good company among collectors, especially the big buyers of minerals, he became a dealer." He contributed many lively articles to *The Mineral Collector*.

That particular exhibition was the means of bringing many collectors together, and of making some lasting friendships. Many of the participants have passed on—really heartrending when I recall how many and I knew them all. It is to be hoped that among the new generation of collectors of minerals there will be those willing and capable of arousing the enthusiasm of all concerned to action that shall have results as happy as those of yore.

Minerals, besides having much beauty, are the one product of Nature which deteriorate but little with time. If one will take the opportunity to linger over the collections in the large Museum of Natural History in New York City, especially on a Saturday, one may as he goes from one department to another hear the young folks enthuse as much, if not more, over the cases of minerals as over any of the other exhibits. And you would suppose that their interests would be keener for the birds, eggs, bugs and butterflies, or shells and the like, than for the minerals and gems. And to beginners a few hints may not come amiss.

Everyone who earnestly begins to collect anything worth while, whatever the incentive to do so may be, passes through several stages of the fever, all more or less severe, and in accord with the enthusiasm manifested in the pursuit of one's objective. The means to the end in view, money, time and labor, to a certain extent circumscribe results, but only to the over-ambitious or the dilettante.

One thing well to consider before letting the fever to collect get a stranglehold is one's occupation. Is that occupation reasonably sure to continue? Is it of such a character that the time needed to visit places, as localities, dealer's stores, homes of friendly collectors, attending club meetings, and the like, will not interfere with that occupation? The vast majority of collectors are amateurs, whatever their possessions may have in any sense cost them.

Field Museum Notes and News Items

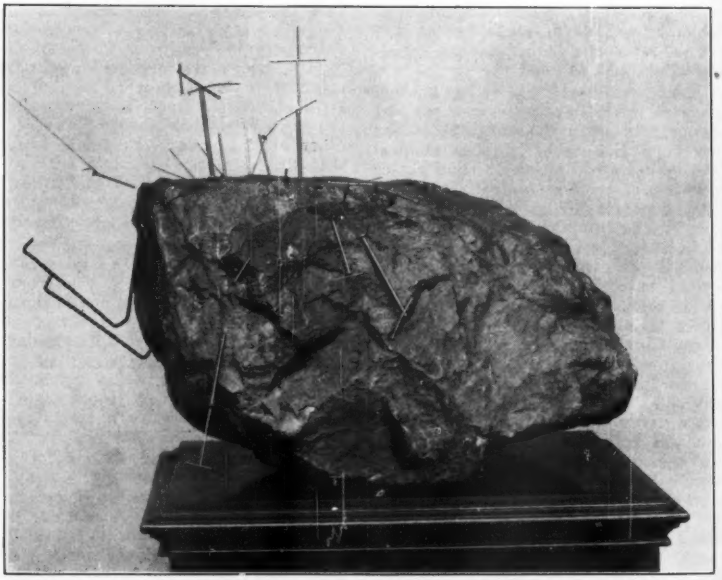
Contributed by

THE FIELD MUSEUM OF NATURAL HISTORY,
Chicago, Ill.

An extraordinary specimen of lodestone, weighing more than 400 pounds, and possessing unusually powerful magnetic strength, has been placed on exhibition in the Department of Geology at the Museum. The huge natural magnet comes from the Wasatch Mountains of Utah.

Lodestone led to the invention of the magnetic compass by the Chinese in the twelfth century. It is a variety of the mineral magnetite which has the property of attracting iron and other metals. A steel needle placed in contact with a lodestone will in a short while become so magnetized that, if free to move, it will point toward the north pole. It was observance of this fact that suggested the compass.

The attraction of the lodestone for iron was known hundreds of years before the polarity of the mineral was discovered, according to Dr. Oliver C. Farrington, Curator of Geology at the Museum.



Courtesy of Field Museum of Natural History.

LARGE NATURAL MAGNET

A powerful lodestone, weighing more than 400 pounds, now on exhibition in Clarence Buckingham Hall at the Museum. Its magnetic effect is shown not only by the iron objects in actual contact with it, but by a nail at the left suspended in the air on a string without touching the stone. This huge lodestone comes from the Wasatch Mountains in Utah.

"Thales of Miletus (630-550 B. C.) mentions this power of lodestone as do a number of later Grecian sages," says Dr. Farrington. "There is a fable that the discovery of the lodestone was made by a Cretan shepherd who noticed that his iron-pegged sandals and iron-shod crook clung to the earth. Digging into the ground he found lodestone.

In classical times and during the middle ages, extravagant tales based upon a misconception of the power of lodestones were current. There were stories of magnetic domes which held statues of iron and even of brass suspended in the air, and there were accounts of mountains of lodestones which drew all the iron nails from ships which ventured near them, so that vessels sailing those seas were obliged to use wooden pegs for nails.

Discovery of the compass has been attributed to many peoples of Europe and Asia. Many accounts of the early use of the compass are now believed to be mythical. One of these credits the Chinese emperor Hoan-ti with constructing in the year 2637 B. C. a chariot on which was a female figure which always pointed south, and there are other Chinese accounts of the use of these "chariots of the south" at various times antedating the Christian Era. Some European authors seem to indicate an occasional use of the compass as early as the third century but the first authentic records of its use do not antedate the twelfth century. Shortly after this time the compass came into general use by mariners. The first compasses were magnetized steel needles which were fastened to chips and reeds and floated on water."

The economic collections of the Department of Geology at the Museum include a vast representation of the many kinds of stones which have been found suitable for construction work of various types.

The great variety of uses to which gypsum is put is illustrated by an exhibit among the economic geology collections at the Museum.

The economic importance of potash, which has increased in recent years, is emphasized in an exhibit of soda and potash, including the famous Stassfurt potash salts, in the Department of geology at the Museum.

A collection of fossil insects and plants and other paleontological material has been received at the Museum as the result of an expedition conducted in the vicinity of Florissant, Colorado, by Bryan Patterson, member of the staff of the Museum's Department of Geology. Excavations were made on several sites, and a large variety of specimens, including a number of previously unknown species, was uncovered.

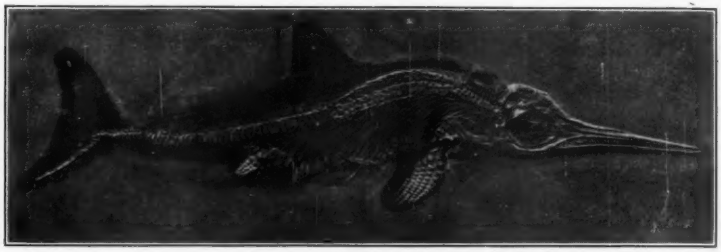
The deposits from which the fossils were obtained are of Miocene age, estimated to have been about twenty-million years ago. Included in the collection are fossils of a flower of the morning glory family, and the feather of one of the earliest birds.

Among the collections representing prehistoric animals at the Museum are the skull of an armored dinosaur, and a nest of fossil dinosaur eggs which were found in the Gobi desert by the Third Asiatic Expedition of the American Museum of Natural History, New York, led by Roy Chapman Andrews. Field Museum cooperated in this expedition.

Some of the earth's most beautiful stones, and examples of their use in the making of vases, dishes and various carved objects and ornaments, are the subject of an exhibit in the Department of Geology at the Museum. Different varieties of jasper, agalmatolite, crocidolite, serpentine, coralline marble, satin spar, rhodonite, various quartzes, obsidian, Mexican onyx, lapis lazuli and malachite are among those included.

A colored sketch depicting a ship at sea, made by the skillful arrangement of quantities of various colored sands in a bottle, is on exhibition at the Museum. Delicate shadings of color and light have been obtained in making the picture, which is viewed from the front of the bottle. No adhesive was used in grouping the sands used in the picture; they are merely arranged as if poured into place, and held fast by filling the bottle with tightly packed sand.

How the iron of which certain meteorites are composed differs from iron ordinarily found on the earth is illustrated by etched faces on many of the specimens of iron meteorites on exhibition in the Department of Geology at the Museum.



Courtesy of Field Museum of Natural History.

ICHTHYOSAURUS FOSSIL SKELETON FOUND IN BAVARIA

A remarkably complete and excellent fossil skeleton of an ichthyosaurus or fish-lizard which lived about 150,000,000 years ago, the specimen possessing the unusual feature of including in the slab of stone in which it is embedded a clear impression of the skin and fins, has been received in the paleontological division of the Department of Geology at the Museum.

The specimen was found in a stone quarry in Bavaria in which lithographic shales are secured. The block of stone in which the fossil was concealed split directly along the skeleton. The specimen is of a comparatively young fish-lizard, being about four feet long, whereas full grown ones are known often to have attained a length of ten feet, according to Prof. Elmer S. Riggs, Associate Curator of Paleontology.

The ichthyosaurus was an animal with a fish-like body, tail and fins, but with a long snout similar to that of a gar pike. Its jaws contained many sharp teeth with which it was able easily to prey upon fishes and other marine creatures.

The formation of stalactites and stalagmites is illustrated in an exhibit in the Department of Geology at the Museum. Specimens from caves in various parts of the world are shown.

Among the fossil skeletons on exhibition at the Museum is one of an oxydactylus or a prehistoric species of camel which lived in North America about thirty million years ago. The bones were excavated in Wyoming.

A systematic collection of rocks, consisting of about 300 specimens of uniform size of all the important rock types is a feature of the Department of Geology at the Museum.

Interest is still being manifested in a Pacific Coast Mineralogical Society and it is hoped to have this organized before the year is out. This Society is to be affiliated with the Rocks and Minerals Association and ROCKS AND MINERALS is to be their official organ. At present three centers have been proposed but it is hoped that once the Society becomes organized and functioning other centers may be opened up.

All members and collectors residing on the Pacific Coast and who are interested in the proposed Society are advised to communicate with one of the following gentlemen: In the Northwest—Dr. Henry C. Dake, 793½ Thurman St., Portland, Oregon; In Nevada—A. Boswell, R. 2, Reno; and in California—Hatfield Goudey, 225 Montgomery St., San Francisco.

Mr. Goudey is keenly interested in having someone in Southern California take charge of this matter and he would be glad to hear from volunteers.

A Check List of Minerals from Kelly, New Mexico

—By—

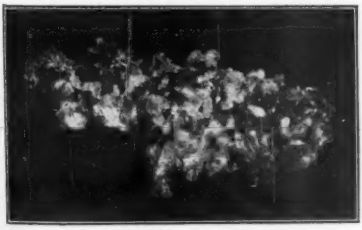
HERMAN WUESTNER

Cincinnati, Ohio

The mining camp of Kelly lies at the west foot of the Magdalena Range, about three miles southeast of Magdalena and at an altitude of 1,000 feet above that town. Magdalena is situated about 26 miles north of west from Socorro with which it is connected by the Magdalena branch of the Atchison, Topeka, and Santa Fe Railroad. The climate is dry and is hot in summer and cold in winter, with rapid alteration typical of the desert and a correspondingly quick oxidation. The minerals which are mentioned below all come from the Graphic (now called "Waldo"), Kelly and Juanita mines, all located near the town of Kelly.

About the year 1905 I received a box of minerals from Mr. C. C. Gordon, at that time employed at the Graphic mine, and some years later Mr. Gordon's private collection was added. As these minerals were of unusual interest I visited the Kelly mines during the summer of 1927 to obtain more material. Unfortunately the Kelly mine was shut down, the Graphic mine working in sulphide ore only, and the dumps of both of these mines had been worked over but the large dumps of the Juanita furnished fine specimens of carbonates and allophane. In visiting these mines in 1927 I learned that during Mr. Gordon's time the very choicest specimens were found and judging from the minerals received from him, those I obtained during my visit, and those displayed in the collections at the various mines, as well as from conversations with residents well acquainted with the mines, I came to the conclusion that I have nearly all, if not all, the different varieties of minerals found here.

As I have not been able to observe the occurrence of these minerals in the mines in place I can only describe them as I find them in my collection.



ARAGONITE AND CALCITE

List of Minerals Found at Kelly, N. M.

Native Silver	Cerussite
Native Copper	Malachite
Galena	Azurite
Sphalerite	Aurichalcite
Greenockite	Hydrozincite
Bornite	Pyroxene
Chalcopyrite	Actinolite
Pyrite	Tremolite
Quartz	Hedenbergite
Cuprite	Epidote
Hydrozincite	Garnet
Tenorite	Calamine
Melaconite	Kaolin
Melanochalcite	Lithomarge
Hematite	Halloysite
Magnetite	Allophane
Limonite	Hyaloallophane
Xanthosiderite	Chrysocolla
Chalcophanite	Prochlorite
Hydrofranklinite	Anglesite
Psilomelane	Barite
Wad	Brochantite
Calcite	Melanterite
Siderite	Goslarite
Smithsonite	Chalcanthite
Monheimite	Gerhardite ?
Aragonite	

Native Silver: In thin plates embedded in allophane and chrysocolla.

Native Copper: In arborescent forms, embedded in cuprite; also in masses partly changed to melaconite.

Galena: Present in considerable amounts in the sulphide zone, but of no mineralogical interest.

Sphalerite: Ususally of a dark brown to almost black color, showing excellent cleavage.

Greenockite: In cavities in sphalerite as a coating and then having a deep

yellow color; also filling cracks in the same mineral, in minute globules of a yellow to brown color.

Bornite: Found sparingly.

Chalcopyrite: In small quantities.

Pyrite: In large quantities; some fine crystals may be obtained.

Quartz: Found as a vein constituent; usually massive or drusy.

Cuprite: Beautifully crystallized in highly modified cubes and dodecahedrons, filling cavities in massive cuprite which often contains native copper. Octahedrons of cuprite of a secondary origin, very small; all altered —mostly to malachite, rarely to azurite. No fresh or unaltered octahedral crystals were observed.

Tenorite: Found in thin scales filling cavities in native copper. Nodules of the latter are found almost completely changed to the amorphous form, "melaconite".

Hematite: var. **Specularite:** also massive, plated and micaceous varieties are found.

Limonite: In considerable quantities but typical limonite is rare. It is usually so contaminated with manganese that it grades into psilomelane. This is also true of their decomposition products, earthy limonite and wad.

Xanthosiderite: Filling cavities in smithsonite; it is of a flocculent nature, fibrous, and of a golden yellow to deep brown color.

Chalcophanite: In crusts of a radiate structure, implanted upon smithsonite. Small brilliant crystals of the same mineral formerly called "hydrofranklinite" are found scattered over the surface of the chalcophanite.

PAPIERSPATH CALCITE

Psilomelane: Found in abundance but typical psilomelane is rare; the botryoidal form is found on the surface of thin layers of this mineral forming the base upon which most of the beautiful carbonates rest. Wad, its alteration product, often impure with limonite, is found sprinkled over and between some of the finest carbonates, adding to their beauty. An earthy, dark brown substance which gives reactions for iron, zinc and manganese, occurs under similar circumstances.

Calcite: Occurs in beautifully twisted forms consisting of thin plates, it is the variety papierspath—or paper spar. It is also found in a great number of other forms. Frequently, the crystals are changed to smithsonite, or only skeleton crystals of calcite changed to smithsonite remain. Sometimes these pseudomorphs are made up of consecutive layers of monheimite, psilomelane, and chalcophanite, and are finally covered with a coating of pearly smithsonite. The variety of calcite known as "rock meal" is found deposited in snow white bunches upon a siliceous limestone.

Siderite: Found in small crystals or in drusy incrustations of a clove-brown color upon quartz, limestone or smithsonite.

Smithsonite: One of the most important minerals both from a mineralogical and economic standpoint. It occurs in crystalline incrustations, botryoidal and stalactitic, ranging in color from white to yellow, to brown to green and blue; the translucent green and blue varieties are often used in jewelry. The stalactites when cut at right angles show rings colored yellow by cadmium and purple rings consisting of innumerable flakes of native copper. Smithsonite also forms pseudmorphs after calcite. "Dry bone", consisting of layers of pearly smithsonite, is abundant. Delicate crystals of cerussite are often encrusted with smithsonite, in some cases the cerussite remains in the center, in others, the cerussite has disappeared.

Monheimite: A considerable amount of smithsonite is of the ferriferous variety called monheimite; a darker colored manganiferous variety also occurs.

Aragonite: Found in delicate capillary forms covering other minerals; in clusters of thick tabular hexagonal crystals, sometimes changed to smithsonite; in botryoidal or mushroom-like forms; and fibrous massive.

Cerussite: Occurs in delicate crystals, massive, and as the "sand carbonate". It is also often seen encrusting galena and is then generally well crystallized.

Malachite: Frequently found replacing azurite and cuprite; also found changed to aurichalcite; pseudomorphs after cuprite are small but abundant.

Azurite: One of the most beautiful minerals found in the district. It occurs in a great variety of forms and ranges in color from a dark blue to green, depending upon how far the change to malachite has advanced. Balls of azurite of the type called "chessylite" are also found.

Aurichalcite: Occurs plated and fibrous, lining open calcite goedes or sprinkled delicately over other minerals. Also plumose or massive.

Hydrozincite: Found in crusts several inches thick, also in banded, agate-like crusts through partial alteration of smithsonite. Sometimes replaces limestone. Also as an alteration product of malachite.

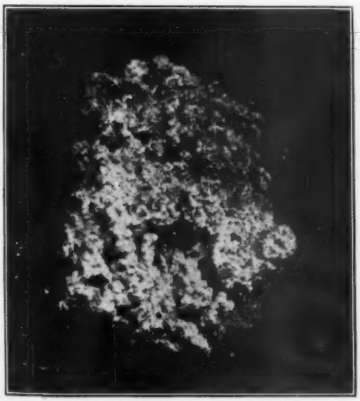
Pyroxene: Occurs in yellowish-green aggregates consisting of very small crystals, with actinolite and epidote, generally associated with pyrite.

Actinolite: Occurs as mentioned above, in bluish green fibers.

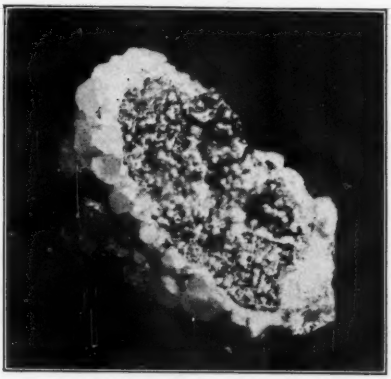
Epidote: Similar to actinolite. In yellowish masses consisting of very small crystals.

Hedenbergite (Ilvaite): A highly altered amphibole, thought by Dr. W. T. Schaller to be possibly ferroanthophyllite, hedenbergite, or ilvaite; possibly a mixture of minerals. At the time Dr. Schaller examined the mineral, and to who I am indebted for the indentification, no pure or unaltered material could be obtained, but while taking a trip to Santa Rita this summer I found the fresh material which now leaves little doubt of it being "hedenbergite". It occurs in four different forms: (1) Coarse columnar, plated, radiated, in nodules a foot or more in diameter, dark brown to black in color. (2) Granular, with thin seams of the same mineral, very delicately radiated, and of a lighter color. (3) Fibrous, straw-yellow in color, very soft, portions of it picked up by a magnet showing it to be a mixture. (4) Grayish-green, with faint fibrous structure, possibly the original mineral as it is found as a nucleous of the proceding. The first mentioned has a metallic luster; all four are associated with magnetite and hematite.

Garnet: Sparingly in trapezohedrons changed to prochlorite; also massive and yellow, associated with sphalerite and bluish-green actinolite.



ARBORESCENT MALACHITE, PSEUDO AFTER COPPER



CALCITE GEODE LINED WITH AURICHALCITE

Calamine: As incrustations, usually upon siliceous limestone; also occurs in porous masses in small amounts.

Kaolin: In white and pink masses; seems to be the result of alteration of rhyolite.

Lithomarge and Halloysite: Both of these minerals are found in small masses, usually colored greenish by copper or brown to black by manganese.

Allophane: In crusts with a mammillary surface; also pulverulent and radiated. Generally bluish in color, but also greenish, brown, or yellow.

Hyaloallophane: A vitreous variety also occurs forming either glassy masses of a fine blue to green color, or in globules, hyalite-like in appearance and of a blue, yellow or brown color, graduating into "chrysocolla" or "copper pitch ore".

Chrysocolla: In small amounts; one variety of a glassy nature passes gradationally into hyaloallphane.

Prochlorite: As pseudomorphs after garnet, but rare.

Anglesite: Showing agate-like banding with some galena, from which it was derived, still visible in the center. Also in crystals forming the outer crust of nodules of galena.

Barite: Occurs sparingly in cavities in quartz.

Brochantite: In very small quantities.

Melanterite, Goslarite and Chalcanthite: Together with an undetermined sulphate, fibrous and of a light blue color. These minerals are found in old mine workings.

STALACTITIC SMITHSONITE
The cut and polished specimen on right has small rings of native copper

CALCITE WITH HEXAGONAL CRYSTALS OF ARAGONITE (changed into Smithsonite)

Pseudomorphs and Alterations

Many changes seem to have taken place among the minerals of this district since they were first deposited.

Limestone: With scalenohedral crystals of calcite are both altered to chert.

Calcite: Crystals of a number of forms are found altered to smithsonite and monheimite; replacements of limestone to the former minerals are common, with the outer portions altered to hydrozincite.

Cuprite: Small octahedrons of cuprite altered to malachite are common, a few were found altered a azurite. One specimen of mixed vein matter is coverd with numerous very small octahedrons, now allophane, most of them are hollow, some show green lines of malachite along the edges of the crystals. A group of well-formed octahedrons of calcite, of course, also a pseudomorph, was a rare find.

Native Copper: Several specimens of an arborescent form of a green color were found. The center of the small branches containing native copper, followed by cuprite, malachite, and the outer portion is altered to aurichalcite.

Garnets: Several crystals of garnets, of the trapezehedral form, were found altered to prochlorite.

Aragonite: In thick tabular crystals is found altered to smithsonite.

Doubtful Minerals

The following minerals have been found in only such small amounts that a positive identification was impossible.

Gerhardite?: A vitreous, emerald to bluish-green mineral of a laminated structure, and one small crystal corresponding to the form of gerhardite; with azurite of which it is an alteration product in cuprite, seems to be that mineral.

A specimen of mixed vein matter is covered with crystals of azurite, which, as can plainly be seen, are altered first to the emerald-green mineral mentioned above, which was found in cuprite. It is in turn changed to a light-blue, fibrous, somewhat radiating, mineral, possibly "shattuckite"; a fibrous mineral, which can be seen coming from the interior of an azurite crystal, light-brown to white in color, then having a silky luster; a number of the fine needles uniting into a point, similar to some forms of pectolite or millerite. Is also an alteration product of azurite; on the side of the azurite crystals the fibers can be seen beginning to form in the heart of the crystal.

Gem Mines of South America

AMETHYST MINES

The South American amethyst mines are located in the Brazilian provinces, Bahia, from whence come the lighter grades of amethysts (alluvial deposits), and Rio Grande do Sul, where the darker grades of amethysts are found. Some of these mines are also situated across the border, on Uruguayian territory. The trade names, Uruguay Amethysts and Siberian Amethysts, are accepted for these varieties. Genuine Siberian amethysts appear but rarely in the market and bring a very high price if of fine quality.

The chief mines on Brazilian ground are situated near the townships of Lagoa the Palmeiras while the Uruguayian mines center around the towns of Catalan Chico and Catalan Grande near the larger town of Artigas, very near the frontier. Near the Catalans is also found the only mine in the world producing, at present, the water agate or enhydros (agates containing large cavities filled with water); the locality is called Tres Serros de Catalan.

The names of the presently worked mines around Lagoa are: Erichim, Bocquerao, Nonohay, and Lageado; while the names of the Palmeiras district mines are: Carasinho, Bella Vista and Palmeiras proper.

Amethysts are found inside of agate geodes and the geodes themselves are found partly in alluvial deposits and partly *in situ*. It is a curious fact and not easily explained why those geodes which possess a thick layer of agate have insignificant amethysts lining their insides, while other geodes, especially those from the Uruguayian frontier, contain fine amethysts coated with a thin layer of poor agate. The Lagoa district produces agates mostly, while the Palmeiras mines yield agate and a large amount of amethyst.

The Bahia mines are located near the little town of Brechin and here are found rolled alluvial stones (amethysts) and geodes lined with large, light-colored amethysts; all the geodes in this district are thinly coated with agate.

The only other important amethyst mines in the world are found on the Island of Madagascar which yield stones similar to the ones from Uruguay.

Museums of the World

This is the continuation of an interesting series of articles on famous Museums of the world, noted for their mineral collections.—*The Editor.*

THE HOUSTON MUSEUM OF NATURAL HISTORY*

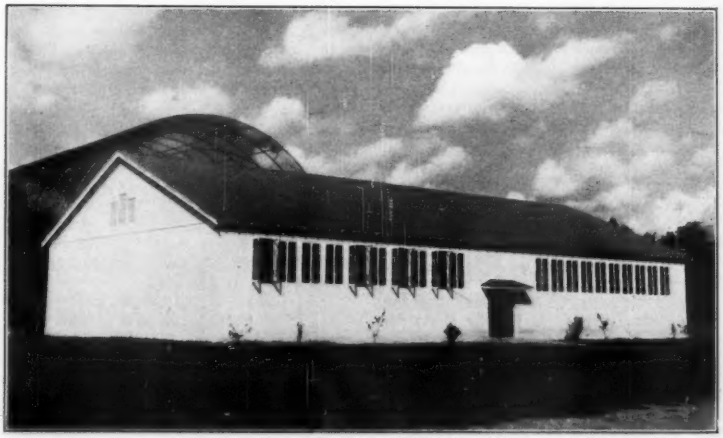
A new building in Hermann Park, the Houston Museum of Natural History, (Houston, Texas) is to house three great collections of art, curios and minerals, which have been brought together from all parts of the world. These collections, in company with many smaller donations of like kind, are the gifts of those citizens of the city whose wish it is to see Houston take rank among American metropolises as a museum center.

The oldest grouping of exhibits is the H. P. Attwater collection of curios, Indian and frontier relics, etc., which was purchased from the collector of that name by the city in 1915.

The Westheimer collection was the first large donation and was given the Museum in 1929, by Sigmund J. Westheimer. This collection consists mainly of foreign material and curios and was originally collected by Attwater and later sold to Mr. Westheimer.

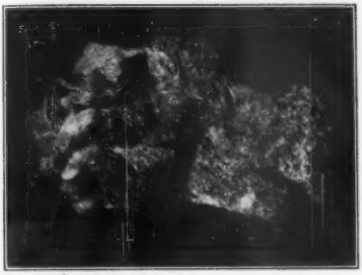
The third and by far the largest collection, as it just about doubles the amount of material on display, is the Major John E. T. Milsaps collection of minerals and fossils, shells, coins and curios. It was to house this collection that a new building had to be erected. The number of minerals in the Milsaps

*Excerpts from *The Houston Chronicle*, July 27, 1930.



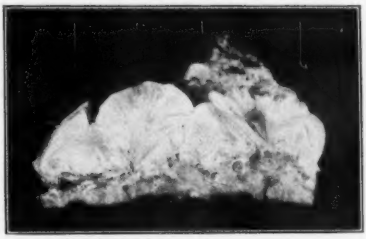
Courtesy of Houston Museum of Natural History

HOUSTON MUSEUM OF NATURAL HISTORY



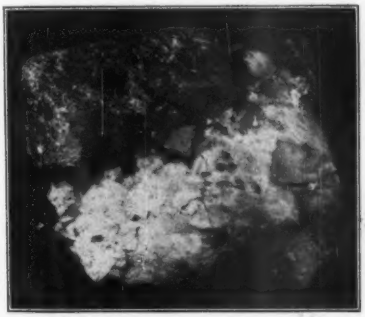
Courtesy of Houston Museum of Natural History

CHALCOPYRITE ON GALENA CRYSTALS, KANSAS



Courtesy of Houston Museum of Natural History

PECTOLITE, WEST PATERSON, N. J.



Courtesy of Houston Museum of Natural History

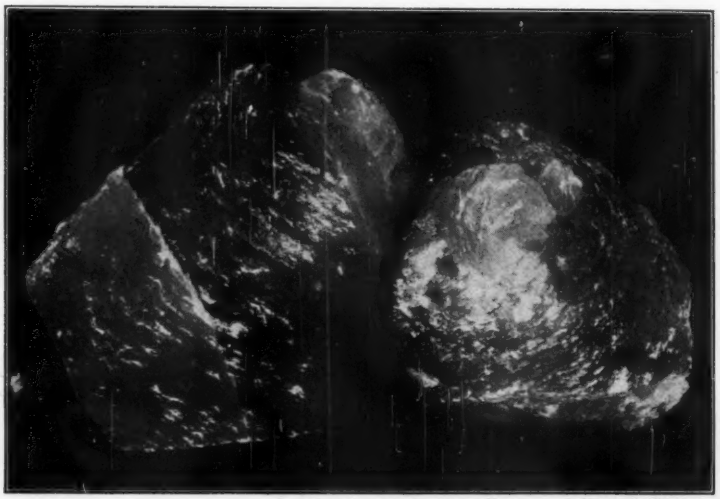
GALENA CRYSTALS ON CHERT, OKLAHOMA

Courtesy of Houston Museum of Natural History

TRAVERTINE FROM CALIFORNIA

Courtesy of Houston Museum of Natural History

CHALCEDONY IN PETRIFIED WOOD, GRIMES CO., TEXAS



Courtesy of Houston Museum of Natural History

CALCITE CRYSTALS, PICHER, OKLAHOMA

Courtesy of Houston Museum of Natural History

GALENA CRYSTALS ON CHERT, PICHER, OKLAHOMA

Courtesy of Houston Museum of Natural History

CHALCOPYRITE CRYSTALLIZED ON DOLOMITE, PICHER, OKLAHOMA

collection is a large one and it presents an astonishing array of beautiful and interesting specimens.

Trips to noted mineral localities are frequently made by the staff members of the Museum and large amounts of choice specimens thus obtained to swell the number on display. Duplicate specimens are also collected for exchanging with museums and collectors throughout the world. The accompanying photographs illustrate some choice minerals that are on display at the Museum.

Houston is fortunate in being the home of a number of experienced collectors of curios, art treasures and minerals. Picturesque among them is William Niven,[1] who was born in Glasgow, Scotland, four score years ago—not very long before H. P. Attwater was introduced to life in London, England, and about the same time that Major Milsaps arrived in what was then a little village on the banks of Buffalo Bayou. For forty years a discoverer of and a dealer in minerals and Mexican antiquities, Mr. Niven has made generous contributions of rare Aztec and Totonacon figurines to the Museum. One collector speaks thus of him—"I consider him one of the greatest field collectors ever.[2] Mr. Niven is a Member of the Board of Directors of the Museum.

Clarence L. Brock, Supt. of Parks, has direct supervision of the Museum development; Parham Haddon is the Curator.

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(1) "My Mineral Discoveries Since 1879," by William Niven. ROCKS AND MINERALS, Sept. 1930. Val. 5, No. 3, p. 73.

(2) ROCKS AND MINERALS, Sept. 1930, Vol. 5, No. 3 "The Bulletin Board."

The Gem Department

Conducted by
GILBERT HART

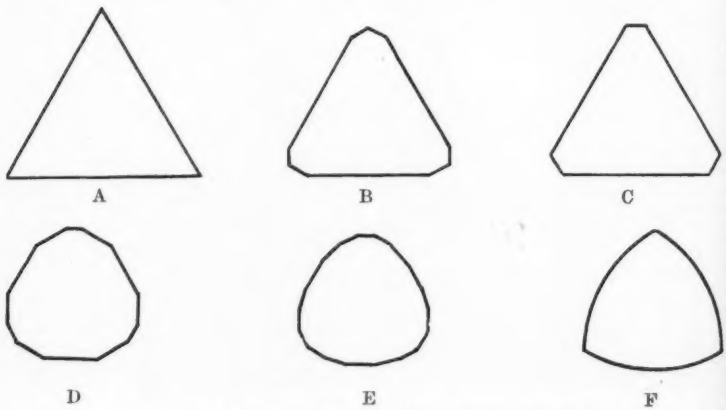
Each issue Mr. Hart will give in this department information concerning gems and gem minerals. As Mr. Hart invites correspondence relating to the department, letters should be addressed to him as follows: Gilbert Hart, St. Edwards University, Austin, Texas.

TOURMALINE

Tourmaline has been used in jewelry since 1703, when the first specimens were sent to Europe from Ceylon. These cut stones interested the scientists of the day by their electric properties; and the thermo-electric character of gem tourmaline began their studies of this phenomen in many other minerals. No tourmaline gems were previously known to Europeans, and it was three generations before the identity of the bright jewels of Ceylon and the black worthless schorl of Saxon miners was recognized.

Earlier, tourmaline had probably been used on the shores of the Mediterranean, for the Roman lyncurium corresponds to our modern gem, especially in its electric properties. Also, "leshem" of the famous Mosaic breastplate is considered to have been a variety of tourmaline. In general, the stone was rare in the Levant, and descriptions vague, so that such early identification is not certain.

The crystals of tourmaline are unusual and can be almost positively identified by their triangular shape. Most other prismatic minerals are four or six sided, or more complex. Tourmalines are usually dominated by a three-faced prism with merely the edges slightly beveled, as in sketch B. Other faces are sometimes developed, occasionally reducing the prism nearly to a cylinder (sketch E) or a triangular shield section may be developed (sketch F). Large crystals are almost invariably striated with deep furrow-like grooves parallel to the prism. Small acicular crystals may have few striations, and intermediate sizes (say one-eighth to one-half inch diameter) may often appear to be intergrown parallel crystals because of the depth of the re-entrants.



TYPICAL CROSS-SECTIONS OF TOURMALINE PRISMS

The usual occurrence of tourmaline is in groups of crystals, individuals are exceptional. Tourmaline-sun is a term applied to radiating groups of thin columns, which are found in joints of granites. Radiating groups are frequently noted in the druses of pegmatites. Aggregates of crystals in parallel growth are common, and variations from almost fibrous groupings to nearly massive columnar structure are noted. In most occurrences one end of the crystal has been attached to some surface from which it grew, leaving only one end to form the many pyramids and rhombohedrons which often terminate these prisms.

Cruciform twins, like staurolite, are rarely found in tourmaline. Occasionally crystals are seen which have been bowed or fractured in many places, and cemented again by the same material. Such curved crystals are most often noted in tne metamorphic gneisses.

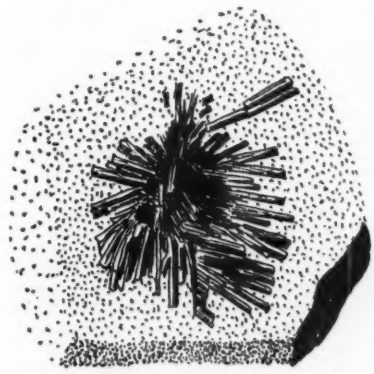
Black is the commonest color of tourmaline. This variety is chemically rich in iron and magnesium and is typically a rock-forming mineral. Its only use in jewelry is in mourning settings, when its luster and hardness render it a much better and more durable stone than true jet. Brown tourmaline of various shades is found, but apparently has little favor among lapidaries. Many shades of green and red are mined from the pegmatites of New England, California, Brazil and the Urals. The color is due to some obscure pigment, but the dark-forming iron and magnesium have been replaced by lithium and sodium in the chemical make-up. Yellow and blue specimens are more rare, even white and colorless ones are known and highly prized by collectors. In the lithia-pegmatite regions many cases of hybrid coloring are found; red prisms within a green outer zone, red on one end with the other green or blue, pale pink prisms with a deep lustrous black tip, and so on for many combinations. Zoned colors are also common in the rock-making tourmalines.

Allied to the color is the dichroism, which is very strong. Sections of tourmaline crystals cut parallel to the long axis appear dead because of the opacity of tourmaline to the ordinary ray of light. The table facet of gems should always be parallel to this long axis to display the full brilliancy. Sometimes tourmaline in fibrous forms is chatoyant when cut cabachon; many cat's eyes are green fibrous tourmaline of this type.

The refractive index of tourmaline is intermediate among gems. Usually it is close to 1.64 and the birefringence interval between the lines of the refractometer is .025. In the green varieties the index is higher, even to 1.69; and the colorless achroite may have 1.61 as its lower index. The specific gravity is somewhat low in relation to the index. Black tourmaline is usually 3.1 to 3.2 in density; the gem varieties are lighter, reds and colorless types usually recording 3.0 as average gravity. The hardness is slightly above quartz, between 7 and 7.5. Tourmaline is brittle, in some cases almost friable and capable of being crushed in the hand. Gem varieties are much stronger, but are so easily chipped that ring mounting of large stones should be avoided. The most showy tourmalines are fixed as single stones for pendant and brooch, or as the central figure of composite pieces.

Chemically, tourmaline is a very complex silicate. Latest researches indicate that there is a series of molecules of varying metal elements, all of which crystallize in the same way and form typical tourmalines by intermixture of these molecules. Boron is present in all of these, in combination with either iron or aluminum. An additional element is also present, perhaps lithium or chromium, or copper, magnesium, potassium, soda or even more iron.

The Gem Section of the next issue will discuss the varieties of tourmaline and their occurrences.



TOURMALINE SUN

Jade

By

EUGENE W. BLANK
State College, Pennsylvania

Jade is a general term that includes two distinct minerals, nephrite or greenstone as it is sometimes called, and jadeite, both of which are somewhat similar in appearance, being fibrous and tough in texture with a greenish color. The term is extremely elastic often being used to indicate any green colored stone having a hardness of between 6 and 7 and capable of taking a high polish. Hence species such as saussurite, californite, bowenite, and plasma are often carved and sold as jade. However as pointed out true jade is either nephrite or jadeite.

The structure of jadeite is either granular or fibrous, the former being more characteristic of the mineral. The structure may be seen to best advantage in thin, translucent, polished objects such as bowls or trays. On holding such a specimen between the eye and a strong light each crystal stands out quite sharply.

The structure of nephrite is characteristically fibrous and usually of such fine grain that the outline of the individual fibres are quite vague and only visible under the microscope.

Nephrite is the more common of the two jades. It is a compact variety of actinolite having the formula $Ca(Mg, Fe)_3(SiO_3)_4$. The color varies from gray to dark green gradually deepening as the relative amount of iron increases. The hardness is about 6.5 on Moh's scale. When polished it acquires an oily luster. The specific gravity ranges from 2.9 to 3.2. Nephrite is fusible before the blowpipe but only with difficulty. The name is derived from the Greek for kidney; the ancient Greeks believing the mineral to possess the virtue of a specific remedy for all diseases of the kidneys.

Jadeite is the rarer of the two jades and is considered the choicest gem. Its hardness is approximately that of quartz but its extreme toughness makes it appear harder than quartz. Its specific gravity is 3.35. In color it varies from pure white to nearly emerald green. The white varieties are often curiously mottled with spots of bright green supposedly due to chromium. The mineral does not crystallize but from optical properties it is either monoclinic or triclinic. In composition it is a silicate of sodium and aluminum having the formula $NaAl(Si0_3)_2$. Jadeite fuses readily before the blowpipe to a transparent, blebby glass, and colors the flame yellow, thus differing from nephrite which is almost infusible. A variety of jadeite that is dark green to black is termed chloromelanite.

The luster of both nephrite and jadeite on fresh fracture is dull and wax-like, with few reflecting surfaces. Polished jadeite usually has a vitreous luster.

With the Chinese, jade has been prized from ancient times, as the stone supreme, and is known by name and appearance to all the vast hordes of China. Jade was held in high esteem by most of the primitive races and many of the prehistoric implements found in Mexico and in the ruins of the Swiss Lake dwellers are carved from nephrite obtained from some unknown source. It has been thought that its presence and use by the early people of Mexico indicates ancient contact between these people and the Orient.

Jade is frequently mentioned in the Confucian Canon. In the Book of History, written about 700 B. C., we read of jade tablets given to feudal chiefs as official recognition of their authority.

In the Book of Rites, which has come down from the first century B. C., we are warned not to hurry when carrying jade, but to drag the feet, and hold the jade with both hands. From which has risen the saying that the superior man should behave as if holding jade, meaning of course, with caution.

In the History of the Han Dynasty, we are told that to fail to educate scholars, and yet to expect a supply of capable men, is like omitting to cut and polish jade, and yet expect it to be artistic and beautiful.

It might be interesting at this point to inquire the Chinese definition of jade. Here is one answer that makes up in picturesqueness for its lack of scientific information. "Jade is the quintessence of Heaven and Earth. It is marked with the dark hues of the hills, with the blue tints

of streams. It is white as sliced lard, red as a cock's comb, black as pure laquer, and yellow as a cooked chestnut.''

According to the Chinese, powdered jade mixed with water is supposed to be a powerful remedy for all internal disorders, to strengthen the body and prevent weariness, and to prolong life. Certainly a most capable medicine if we can believe the Chinese.

The most important locality for jadeite is the Mogaung district of Upper Burma where the jadeite occurs in boulders imbedded in a reddish-yellow clay in the various tributaries of the Dschindwin River. The boulders are mined by digging shallow pits and broken by heating over fires. When pieces of jadeite of suitable quality are found they are cut by native artisans who use a steel wire kept taut by a bamboo bow. Practically the whole yield goes to supply the Chinese markets. Jadeite is also found in the Shensi and Yunnan Provinces of China and Tibet.

Much nephrite comes from localities near the southern boundary of Eastern Turkestan and further north along the river Kashgar. The mineral also occurs in various provinces of China; Silesia, Germany, and New Zealand. Nephrite has been discovered recently in both Alaska and British Columbia. Gigantic waterworn boulders of the material have been found in stream beds near Lake Baikal in eastern Siberia.

Mention must be made of the other minerals sometimes termed jade. Saussurite is a decomposed feldspar and is closely related to the mineral zoisite. It is greenish gray to white in color and occurs near Lake Geneva.

Bowenite is a green serpentine which is found at Smithfield, Rhode Island and in Afghanistan and New Zealand. Californite and plasma are compact varieties of idocrase and chalcedony respectively. Verdite is a stone of rich green color found in the form of large boulders in the North Kaap River, South Africa.

Gems of the Southwest

—— *By* ——

NELL LOUNSBERRY

CHRYSOPRASE

In olden times chrysoprase (kris-o-praze), a variety of chalcedony, was valued so highly as to be set in circlets with pearls and diamonds, one faultless gem large enough for a ring set, bringing from $50 to $100. Only the very inferior specimens were used for necklaces, brooches and larger sets, while the poorest grade of all was utilized in snuff boxes, seals, cups, etc.

At that time it was found only in Siberia and Germany; Frederick the Great doing much to encourage the search for it in the Silesia district of Germany. We find mention of it in the oldest records as well as in the Bible. Then came the discovery of great deposits in the New World—one vein in nickel ore near Riddle, Oregon, being over an inch thick. Other discoveries were made in Tulare County, California, twenty miles east of Visalia, where the gem was so plentiful as to bring the value down nearly to that of the common chalcedony. It is also found in North Carolina.

One fault which has always detracted from its value is its characteristic of fading during periods of heat and great drought. For the sake of preservation, gems of chrysoprase are often stored in damp cotton. Its usual color, bright apple-green due to nickel oxide in the composition, is sometimes speckled with yellow brown. It is translucent or semi-transparent with a hardness little inferior to that of flint.

A Compilation of Gem Names

— *By* —

GILBERT HART

St. Edwards University, Austin, Texas

Mr. Hart and ROCKS AND MINERALS will be glad to have readers send in additional gem stone names not here included or suggestions as to any corrections in names which they believe should be made.

This is a continuation of the very interesting compilation of gem names (the largest ever printed) made by Mr. Hart, the first installment of which appeared in the December, 1927, issue of the magazine. This list will be continued until completed.—The Editor.

Sabalite—variscite, yellowish to greenish banded phosphate which is very similar to variscite if not identical.

Sacred Turquoise—smithsonite, pale blue.

Sagenite—quartz, rock crystal which is filled with inclusions of needle or hair-like fibres, usually rutile. Following names are used for different varieties of sagenite: **Asteriated Quartz, Avanturine, Aventurine, Aventurine Quartz, Byssolite, Cat's Quartz, Crispite, Cupid's Darts, Fleches d' Amour, Gold Quartz, Gold Stone, Hair Stone, Hawk Eye, Hedgehog Stone, Hungarian Cat's Eye, Hyacinth of Compostella, Lizote, Imperial Yu Stone, Love Arrows, Myrickite, Needle Stone, Occidental Cat's Eye, Onegite, Rutilated Quartz, Sagenitic Quartz, Satrolite, Schiller Quartz, Sinopal, Sinople, Star Quartz, Star Stone, Thetis Hair Stone, Venus Stone.**

Sagenitic Corundum—corundum, asteriated, usually with rutile inclusions.

Sagenitic Quartz—quartz, rock crystal, with scattered needles of various minerals. Compare sagenite.

Salamstone — corundum, transparent pale red to blue, from Ceylon.

Samarskite — Orthorhombic, usually massive; black; hardness 5 to 6; specific gravity 5.7; niobate of yttrium.

Sandy Sard—quartz, sard dotted with darker spots.

Sanidine—orthoclase, in glassy crystals.

Saphir d' eau—cordierite, blue.

Sappare—cyanite, transparent.

Sapper—cyanite, transparent.

Sappharine—quartz, blue.

"Sapphire" — suffix applied to blue stones of low grade with a locality adjective.

Sapphire—corundum, mineralogists apply sapphire to all clear transparent specimens of corundum, while jewellers limit the name to those which have a decided blue tint and are suitable for gems. The most desired color is corn-flower blue.

Sapphire Quartz—quartz, blue.

Sapphirine—a silicate mineral of pale blue color, rarely found in the metamorphic rocks, and not known in large enough crystals for gems. (2) quartz, blue quartz or chalcedony; (3) spinel, blue.

Sard—quartz, chalcedony of rich brown color with reddish tint.

Sardian Onyx—quartz, sardonyx.

Sardian Stone—quartz, sardonyx.

Sardine—quartz, carnelian.

Sardine Stone—quartz, carnelian.

Sardoine—quartz, chalcedony of brownish red to dark brown color.

Sardony—quartz, sardonyx.

Sardonyx—quartz, chalcedony, alternate bands of white and brown.

Satelite—serpentine, cat's eye.

Satin Spar—aragonite, finely fibrous with silky luster. (2) calcite, finely fibrous with silky luster; (3) gypsum, finely fibrous, with silky luster.

Saturnine Onyx—quartz, onyx of very dark colors.

Saussurite—rock composed principally of zoisite.

Saxon Chrysolite—topaz, pale wine yellow to yellowish green.

Saxon Topaz—topaz, pale wine-yellow. (2) quartz, citrine.

Scapolite—a group of silicates; tetragonal; pale colored; hardness 5.5 to 6; specific gravity 2.5 to 2.8; silicates of aluminum with calcium or sodium. Gem varieties: **Wernerite, Wilsonite.**

Scenic Agate—quartz, moss agate whose inclusions resemble landscapes.

Scepter Quartz—quartz, rock crystal. Thin prisms surmounted by stouter ones, resembling the knob on a scepter.

Schaumburg Diamond—quartz, rock crystal from Schaumburg, Germany.

Schiller Quartz—quartz, cat's eye.

Schiller Spar—enstatite.

Schnecken Topaz—quartz, citrine.

Schorl—tourmaline, formerly used for all tourmaline, now limited to the black variety.

Schorlomite—member of the garnet group of silicates; isometric; usually massive, black; hardness 7 to 7.5; specific gravity 3.88; silicate of calcium, with iron and titanium.

Scoopstone—amber collected from seaweeds.

Scotch Pebble—quartz, cairngorm or agate.

Scotch Topaz—quartz, smoky.

Seafoam—meerschaum.

Sea Stone—amber cast up on the shore by the sea.

Selenite—gypsum, colorless and transparent.

Semeline—titanite, greenish, from Lake Laach on Rhine.

"Semi"—prefix refering to imperfect specimen of type named, as of inferior color, transpareney, etc.

Semi-carnelian—quartz, agate, yellow.

Semi-opal—opal, common opal, somewhat opaque, colorless to highly colored.

Semi-turquoise—turquoise, soft pale blue.

Sepiolite—compact, earthy; white; hardness 2 to 2.5; specific gravity 2; hydrous silicate of magnesium. Names for ornamental varieties: **Cream, Meerschaum, Seafoam.**

Serpentine—massive; green of many shades; hardness 2.5 to 5; specific gravity 2.65; hydrous silicate of magnesium. Names for ornamental varieties: **Bostonite, Bowenite, California Cat's Eye, California Tiger Eye, Lapis Colubrinus, Lizard Stone, Metaxite, Moriah Stone, New Zealand Greenstone, Noble Serpentine, Ophicalcite, Ophiolite, Ophite, Pelhamite, Picrolite, Precious Serpentine, Retinalite, Ricolite, Satelite, Serpentine Cat's Eye, Serpentine Marble, Taxoite, Verde Antique, Williamsite.**

Serpentine Cat's Eye—serpentine which shows chatoyance.

Serpentine Marble—serpentine, especially that which takes a polish.

Shinarump—quartz, agatized wood.

Siam—corundum, dark red ruby.

Siam Ruby—spinel, dark red. (2) corundum, dark red, from Siam.

"Siberian"—prefix refering to a pale colored gem of the species named; (2) prefix refering to a tourmaline gem of the color denoted by the species named.

Siberian Amethyst—quartz, amethyst of rich dark color.

Siberian Aquamarine—beryl, very light greenish blue.

Siberian Chrysolite—garnet, demantoid variety of grossularite.

Siberian Ruby—tourmaline, red.

Siberian Topaz—topaz, very pale blue to bluish white.

Siberite—tourmaline, violet-red.

Siderite—quartz, blue, may be crocidolite replaced by quartz.

Silex—quartz, an old term not little used in the gem trade.

Siliceous Malachite—chrysocolla, green.

Silicified Wood—wood replaced by silica, either quartz or chalcedony.

Sillimanite—orthorhombic; usually in prisms; brown; hardness 6 to 7; specific gravity 3.24; silicate of aluminum. Gem names: **Bamlite, Bucholzite, Fibrolite, Monroelite, Xenolite.**

Simetite—amber, rich hyacinth red, often fluorescent.

Sinopal—quartz, aventurine.

Sinople—quartz, aventurine, with red hematite inclusions.

Sinter—quartz, siliceous deposit from hot springs.

Slave's Diamond—topaz, colorless.

Smaragd—beryl, light green.

Smaragdite—actinolite, grass-green.

Smaragdus—smaragdite.

Smithsonite—hexagonal; usually botryoidal; greenish to bluish; hardness 5; specific gravity 4.3; carbonate of zinc. Gem names: **Azulite, Bonamite, Turquoise.**

Smoke Stone—quartz, smoky.

Smoky Quartz—quartz, smoky brown to yellowish brown or brownish black.

Some Notes on the Ruby

—— By ——

GEORGE O. WILD
Inst. f. Edelstein-forschung, Idar, Germany*

The ruby is a mineral composed of aluminum oxide with traces of chromium oxide which gives it its color. The pigment is very probably in molecular solution. As aluminum oxide has a strong crystalline urge, the ruby is quite easily obtained synthetically by just fusing its components in an oxygen-hydrogen flame. The product thus obtained differs but little from the natural ruby, as far as chemical and physical properties are concerned. Its color is produced in distinct zones which are curved instead of being straight as is the case with real rubies. While the real material contains inclusions which are peculiar to certain provenienees, the synthetic stone is rather clean except that it contains gas bubbles which render it at times unfit for technical uses as for jewels, etc.

Both, the real and synthetic rubies, exhibit the same properties when heated to high temperatures. They turn a dull deep red and cool, via a greenish state (near 600 degrees C.). The color, after heating, is identical to the original color. The pigment is, therefore, very closely attached to the molecule and is probably isomorphously mixed.

There exists only one analysis showing a trace of chromium but recent spectroscopic investigations have revealed that all pink corundums contain some chromium, i. e., the rose Montana sapphire, the pink Ceylon sapphire, and the blue Ceylon stone with a purple tinge (this variety loses its blue color when heated and the result is a rose sapphire the color of which is stable).

Ruby fluoresces when exposed to ultra violet light of an iron arc or of a mercury vapor lamp. The color which it emits is of a deep red and this red light is excited by the invisible ultra violet rays as well as by green light. The same fluorescence can be observed with emeralds which also owe their green color to an addition of chromium, but here, to the silicate molecule. A plate of ruby placed between a source of white light and a spectroscope which allows the white light to be fanned into a band showing the spectrum colors, red, orange, yellow, green, blue and violet, shows that some of the light rays are absorbed by the ruby molecule. Thus all violet rays and part of the green rays are held back or filtered off. Besides, certain distinct wavelengths are absorbed and closer investigation shows that some red light waves are filtered off. There are two sharp absorption lines in the red part of the spectrum and these coincide with the red lines emitted under the influence of ultra violet light. The emission and absorption lines are identical. This is of high scientific importance. Emerald shows the same phenomenon.

Besides visible light, the ruby also filters off some of the ultra violet invisible rays emitted by a carbon arc containing iron or nickel. Recent investigations along these lines have revealed that the transparency of the synthetic material is greater than that of the real stone. The higher absorption of the latter is probably due to a certain iron content which tends to absorb ultra violet light as is shown by glass which invariably contains iron and is more or less opaque for ultra violet light.

Expressed in terms of spectrum measurement the absorption of the synthetic ruby begins at a region near 2700 Angstrom Units while that of the real ruby begins near 3200. A spectrum taken with a plate of ordinary glass would be still shorter than that of the real ruby; glass absorbs even more ultra violet rays. The spectrum would end somewhere near the heavy line bordering the absorption regions of the synthetic ruby spectrum. It would, however, let those violet rays pass which we find filtered off by the rubies so that we would find a continuous band from the red end down to the point indicated.

*Institute for Precious Stone Research.

Mineralogical Notes

— *By* —

ALBERT C. BATES

The trap-rock quarries in and near Paterson, N. J., abound in a wide variety of nicely crystallized minerals with which most all collectors are familiar. But there are several kinds or types of altered or pseudomorphous products coming out of the amygdaloid, from time to time, that are still subjects for speculation to the identity of the original crystallizations.

Pseudomorphs are formed by several causes—by alteration, by substitution, by incrustation and by paramorphism (here the reader may have recourse to a dictionary).

My object now is to refer to some curious forms of prehnite shown by Mr. John A. Grenzig of Brooklyn, N. Y. (which he secured this summer at Paterson), at a recent meeting of the Newark Mineralogical Society. The prehnites were of fine color (sea-green) and all had the usual external appearance of this mineral. They were pseudomorphs by incrustation. That is—the prehnite formed a crystalline mass on, or over, a crystal of some other mineral and that mineral had been dissolved out by natural processes leaving behind only a hollow form or cast of the original crystal.

There were two general types shown, each measuring about 2½x2½ inches; some were of spearhead form, the others round with oval tops suggesting stalactitic form. All had clean heads or tips with bases broken from the matrix. Had this mineral been found in place of occurrence by Mr. Grenzig or some other experienced mineralogist, the original mineral might have been determined. As matters now stand—a revival of the old speculations as to naming some of the original minerals of the locality is at hand. The prehnites in question are unique and desirable.

Artificial light is a poor medium for showing off the beauty of crystals. Daylight, as clear as it can be, is the ideal light though miners think crystals most beautiful as they come upon them in the place of their occurrence. Perhaps the romance of discovery gives the miners this notion, whereas the collector likes only to show his specimens with day light in his cabinet. Nothing is so dead as a museum at night. About the only thing a collector can do with his minerals at night in artificial light is to arrange and re-arrange his specimens.

This note does not apply to extra large groups of crystals or polished slabs of gorgeous color, especially thin slices of agate and malachite or thin-walled geodes. That these lend themselves to the making of a brilliant showing was abundantly proved by the late Col. Thompson in the manner in which he electrically illuminated his wonderful collection of such specimens in his home at Yonkers, N. Y.

While breaking up some old bicycle lamps I tried one of the lens to see if it would magnify. It did so, nicely. I ran across some cold cream jars in the cellar and found that the rim that held the lens, or oval glass, fitted nicely on these jars. I then got some adaptedly shaped pieces of prehnite, drusy quartz, and one of actinolite, to put in the jars—after everything in the scheme had been nicely cleaned—and the effect was good. Try it out for yourself. I am leaving the jars on the shelves, labelled, permanently.

Small fragments of Australian Black and light Fire Opals, which are very interesting little specimens, can be obtained, gratis, from N. H. Seward, 457 Bourke St., Melbourne, Australia. This firm specializes in opals and they will be pleased to send these little souvenirs to our readers. Postage to Australia is 5c.

Duty on rough minerals and rough precious stones: Under the new tariff the duty which was formerly 10% has been removed. All rough specimens are admitted free but when partly worked or polished they pay 50% duty. The duty on cut precious stones is at present 10% of the value.

A Trip to the Illinois Geode Field

— By —

T. B. PETTIGREW

Roanoke, Illinois

Our first trip to the Illinois geode field in Hancock County was made under recent date. Here there is an abundance of "nigger heads", as geodes are termed by natives of that vicinity, and they are found mostly in the beds of streams or in pits where rock is being lifted out for road construction. As to be expected, the best are always picked up but there are still many enough to go around and thousands are shipped for rock gardens or other purposes.

Two kinds of geodes are found, the quartz centers and the chalcedony varieties, although the latter seems to be scarce. The solid geodes are the most common but with little care and study one can soon distinguish between a solid and a hollow one.

The geodes vary in size from that of a baseball up to a good sized pumpkin and the surface of these geodes differ with those found in the neighboring state of Iowa. We found hundred of geodes that apparently were only half-made and which we called "misfits."

Small creek streams have washed away the soil, clay, sand and sub-soil until they now flow over a bed of limestone, and with each high water more soil and sand are loosened and with them come the geodes. If I were to make a guess, I would say that the country around for miles is full of geodes. We noticed several small geodes lying around the school grounds where some material had been hauled in as fill, while every native, it seems, has a lot of them in his back yard, stacked up like cannon balls, for ornamental purposes.

Limestone bluffs run through this field for some distance and it is in this limestone that the geodes have their origin. As the limestone disintegrates and wears away, the geodes are exposed, loosened and fall out, later to be washed away and recovered in the stream beds and pits as mentioned above.

There is also a great abundance of fossils in this limestone—shells of all descriptions as well as vertebrates of many small fish. The high school superintendent sent a number of boys out with us, as guides, and they soon had their pockets filled with many choice fossils.

Slabs of clear quartz are also present in the limestone and these stand out distinctly and glisten in the sun, making a boy collector just wild with joy to gather them as they make attractive specimens.

I am anxious to hear of other geode fields through ROCKS AND MINERALS. Dr. Dake of Portland, Ore., told us of his finds at Antelope, Ore. (see p. 108, Vol. 4. No. 4. Dec. 1929.) May we hear from others?

NEWLY ISSUED MAP SHOWS PRODUCTION OF MAJOR METALS IN THE UNITED STATES

A glance at a map in colors recently issued by the U. S. Bureau of Mines, makes apparent the relative value of gold, silver, copper, lead, zinc and iron ore produced annually in the United States. The location, principal metal product, and approximate size of each of the important metal-mining districts are shown on the map, which was prepared by Elmer W. Pehrson and the Common Metals Division, from data collected by the Division of Mineral Statistics. Diagrams in colors for each state and the United States as a whole show the relative importance of each metal in the States' and country's total metal output.

For those who desire precise data, a tablet is appended showing the quantity and value of each metal produced by each important metal-mining district and state and its relative importance in state and country totals.

The map presents a graphic visualization in colors of the major metal production of the United States, and makes an attractive wall chart. A limited number are available for free distribution. Requests should be addressed to the U. S. Bureau of Mines, Department of Commerce, Washington, D. C.

Bibligraphical Notes

Bauer-Schlossmacher: *Edelsteinkunde* is nearly complete in a new edition appearing in 10 volumes at $1 each. May be ordered from E. Westermann, Inc., 13 W. 46th St., New ork, N. Y.

This work covers the entire field of precious stones and can be considered the standard work in this line. The results of the latest research has been considered in writing this book of which there is no English edition at present. If interested in an English translation please advice Dr. Schlossmacher, Mineral Institut. University of Koenigsberg, Koenigsberg, Germany.

Liesegang: R. Ed.: *Die Achate* (Agates). The formation of banding in agates; an application of the phenomenon of rhythmical diffusion; and the various processes of agate coloring are described.

Epsig: *Synthetic Stones.* A circular describing the manufacture of synthetic stones with instructive pictures. Can be obtained gratis from Institut. f. Edelstein Forschung, Idar, Germany. Enclose 5c for return postage.

E. Leitz, Inc., 60 E. 10th St., New York, N. Y., issue an interesting bulletin covering apparatus for preparing minerals,—cutting, grinding and polishing.

Cartiers, 5th Ave. at 51st St., New York, N. Y. A pamphlet on birthstones is issued, gratis, by this firm.

Holden: *The cause of color in smoky quartz and amethyst. The American Mineralogist*, Sept. 1925, Vol. 10, No. 9, page 203.

P. C. Kullman & Co., 110-116 Nassau St., New York, N. Y., have recently issued (gratis) an interesting little pamphlet covering the elements. So far 91 elements are known and these have been compiled in the pamphlet with names, atomic numbers, symbols, atomic weight, melting points and years of discovery.

U. S. Bureau of Mines, Washington, D. C. Publications recently issued that are of interest to mineral collectors are the following Information Circulars:—

I. C. 6190. Beryllium and Beryl, by Alice V. Peters. 20 pages.

I. C. 6312. Radium by Paul M. Tyler, 55 pages.

I. C. 6313. Marble, by Oliver Bowles and D. H. Banks. 20 pages.

I. C. 6317. Selenium and Tellurium, by R. M. Santmyers. 23 pages.

I. C. 6321. Monazite, Thorium and Cerium, by R. M. Santmyers, 43 pages.

I. C. 6328. Tantalum (and Columbium), by E. P. Youngman. 37 pages.

I. C. 6329. Sulphur, by Robert H. Ridgway. 55 pages.

I. C. 6331. Cobalt, by Paul M. Tyler. 33 pages.

The Sluice Box

— By —

A. Riffle

"Is there any lion hunting around here?" asked the commercial traveler who was talking to "Old Bill."

"Well," said my old friend, "there will be lots of "lying" hunting around the garage stove from now on."

Who among our more learned subscribers is going to write an article on crystallography? This is something that would be much appreciated by the younger readers.

This has been a busy season for me and I have seen but little of "Old Bill" but both of us wish you all a Merry Christmas and a Happy New Year. We shall try to make *The Sluice Box* larger and more interesting during 1931.

THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y., U. S. A.

Organized to stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not as yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST, 24, 1912.

Of Rocks and Minerals published Quarterly at Peekskill, N. Y. for October 1, 1930.

STATE OF NEW YORK, } ss.
COUNTY OF WESTCHESTER }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Peter Zodac, who, having been duly sworn according to law, deposes and say that he is the Editor and Publisher of the Rocks and Minerals and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

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PETER ZODAC, Publisher.

Sworn to and subscribed before me this 8th day of October, 1930.

KATHRYN M. FLANAGAN.

(Seal.)
My commission expires March 1931.

Membership Department

New Members Enrolled—July 25-October 25, 1930

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New Members secured since January 1st, 1930, by:

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